All in a Day's Play

A grad student sees how much she can pack into 14 hours of IAP.

by Christina Couch, SM '15 April 21, 2015

In a conference room in MIT's Media Lab, Grace Leslie is closing her eyes, breathing deeply, and using her brain waves to paint. She's wearing a wireless headset that reads EEG activity; as the activity changes, so does an abstract image on a screen at the front of the room. "Your head is like a fish tank," she says. "Let all the

water out." As the mental water drains away, the pinkish-purple blob on the screen slowly changes from vibrant fuchsia to warmer earth tones. The more relaxed she becomes, the deeper the red and brown hues appear.

Brain painting isn't as easy as Leslie, a postdoc in the Media Lab's Affective Computing Group, makes it look. When two students try, one fails outright while the other barely makes the colors shift. Mastering your mental state turns out to be tricky. But then, everyone who signed up to take Leslie's Brain Hacks class was looking for a challenge. In this crash course on brain-computer interfaces, held during this year's Independent Activities Period (IAP), her students have two weeks to design and build a system that's driven by the brain's electrical activity. They consider such things as a mind-controlled laser pointer and an app that uses brain waves to measure how sleepy a particular meal is making the user.

Building a cranially connected computer program in a fortnight is ambitious, but it's par for the course during IAP, the monthlong mini-semester that lets students, faculty, alumni, and staff explore new ideas or pursue their passions. Each January, IAP provides a smorgasbord of offerings from one-hour workshops to multiweek seminars on such topics as biomedical imaging, augmented-reality dance, cold fusion, and Beyoncé and black feminist thought. On most IAP days, participants can choose from 70 to 90 classes and activities, spanning the scholarly, the practical, and the esoteric. CIA-approved kidnapping escape techniques, anyone?

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Today I'm on a mission to see how many IAP workshops I can squeeze into one day, starting with Brain Hacks from 9 to 12. By 12:30, I've made my way to Building 9, where students in Forces Frozen are making icy fabric domes. They cobble together makeshift frames from materials including wood, hula hoops, or PVC pipe, then head outdoors and drape damp fabric over the frame to achieve a cool, curvy shape. With some spritzes of water and help from the Cambridge winter, the fabric freezes; they flip the frozen structure upside down, and voilà—they've created a solid dome, no modeling software or complex math required.

In this class, inspired by the work of Swiss structural engineer Heinz Isler, the goal is to use frosty temperatures and low-tech materials to explore geometrically complex architectural shapes, says Caitlin Mueller, an assistant professor of building technology and co-director of the Structural Design Lab. Fluid structural forms can be tough to make using traditional modeling methods, but the frozen-shell technique allows for quick prototyping and provides time for students to tweak their twisty towers, sweeping arches, and ice octopuses by hand. "We're from Singapore," two exchange students from the Singapore University of Technology and Design tell me. "Ice is very exciting."

At 2 p.m. in the Plasma Science and Fusion Center, astrophysicist Michael Stevens, SM '06, PhD '09, tells his Space Weather Research class that "space weather won't kill you, probably." But there's about a 10 percent chance that a massive solar storm will interfere with radio and GPS signals and knock out power grids within 11 years; Stevens says such a storm could wreak as much havoc on Earth as a major natural disaster. For the next hour, he outlines the environmental conditions that exist just beyond our atmosphere—think galactic cosmic rays and solar winds—and the challenges scientists face in anticipating what will happen next.

"Imagine trying to tell what the terrestrial weather is going to be in Boston if we only have one weather station in the world and it's in Hawaii," Stevens says. "That's kind of what forecasting space weather is like." But better data collection systems and the February launch of NOAA's DSCOVR solar-wind monitoring satellite (whose plasma sensor was built at MIT) should provide a clearer picture of the conditions space travelers of tomorrow might face.

At 3 p.m. in a tiny classroom two floors above MIT's Hayden Library, digital humanities librarian Patsy Baudoin is leading an an informal discussion on the pedagogic and practical issues that arise when humanities collections get digitized. There are plenty: What's the best way to preserve and protect collections stored online? How will electronic curation decisions affect scholarly research or academic tenure? How can institutions organize and tag data in a way that's searchable for everyone?

At 6 p.m., Nancy Ouyang '13 begins tonight's session of her Exploring Public Genomes seminar, a fast-paced primer on bioinformatics and the medical perks (and privacy perils) of making your genetic data available to the masses.

"It's very likely that if you get cancer of some type, you will get it sequenced nowadays," says Ouyang, who works for https://curoverse.com/, which is developing an open-source biomedical-data platform.

Ouyang's weeklong workshop covers major public initiatives like the Personal Genome Project, delves into medical findings that have emerged from online genome libraries, and addresses challenges that both researchers and participants face when a vast amount of genetic data is online. We use laptops to play with tools like the Broad Institute's Integrative Genomics Viewer, which helps users visualize genomic data sets, and look up variance in specific genes through the bioinformatics database Kaviar. "A human genome is three billion puzzle pieces," Ouyang says. "Where do they go? What do they do? We're still trying to figure that out."

An hour later, I'm trying to figure out my two left feet as I attempt Israeli folk dancing. Part of a weekly series that runs throughout the academic year, tonight's dance attracts many from MIT and the greater Boston community who move flawlessly through 60 to 70 traditional and modern folk dances over the next three hours. David Karger, a computer science professor who's been attending the dances since 1983 and has occasionally taught Israeli folk dancing as a physical education elective himself, says that some regulars have a repertoire of several hundred dances.

"MIT students just seem to have an affinity for it because it's very structured," he says. "There are these patterns you learn, and then you assemble larger patterns out of the smaller patterns."

My feet aren't nearly as adept at forming those dance patterns as everyone else's in the room, but several people offer to teach me the basics. Armed with a few new dance moves, my head swimming with

genomes, giant ice structures, and galactic cosmic rays, I'm headed home, counting the days until next year's IAP.

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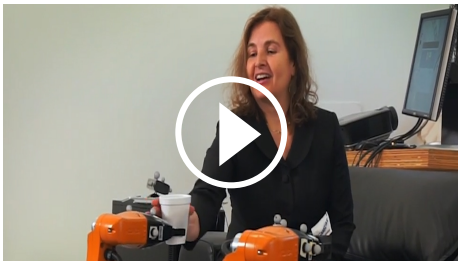

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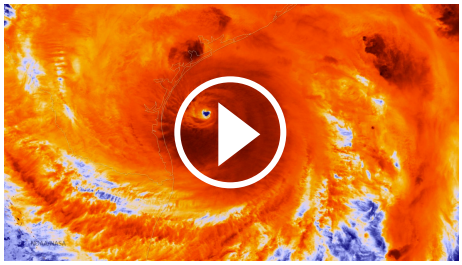

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